Product Market Regulation and
Macroeconomic Performance:
A Review of Cross Country Evidence

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ABSTRACT

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The main purpose of this paper is to provide a critical overview of the recent empirical contributions that use cross country data to study the effect of product market regulation and reform on a country's macroeconomic performance. After a brief review of the theoretical literature and of relevant micro-econometric evidence, the paper discusses the main data and methodological issues related to empirical work on this topic. It then critically evaluates the cross country evidence on the effect of product market regulation on mark-ups, firm dynamics, investment, employment, innovation productivity, and output growth. A summary of what we learn from the econometric results concludes the paper.

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1. Introduction

During the last fifteen years many countries at different levels of development have introduced significant regulatory reforms of the product market, of factor markets, and of the financial sector. Most of the empirical literature on the effect of product and factor markets regulation (or regulatory reform) has focused on the labour market. Much of it has focused on explaining the different performance of continental European countries versus the United States and other OECD countries or the effect of relaxation of constraints in particular countries. A substantial literature has also developed on the effect of financial reform on a country's real performance for both developed and developing countries.

The area that has been comparatively under-researched is the effect of product market regulation on macroeconomic outcomes, with the exception of the effect of barriers to trade. Yet, by now a number of contributions have appeared that have started redressing this imbalance and have shed light on the overall effects of product market regulation. The main purpose of this paper is to provide a critical overview of the recent empirical contributions that use cross country data to provide insights on the effect of such product market regulations/reforms on a country's macroeconomic performance.

We will start in Section 2 with a discussion of the main channels through which regulation can affect macroeconomic performance and review a few seminal micro level studies that are relevant for the issue under discussion. We then discuss in Section 3 the main characteristics of the regulatory data available and the methodological challenges that researchers face in assessing the effect of regulation on performance. Finally, in

Section 4, we review the salient empirical contributions in this area. The final outcome measures we focus on are the demand for labour and capital, firms' innovative activity, and productivity and output growth. Intermediate outcome variables are mark-ups and firms' entry, exit, and turnover rates. A summary of the main conclusions is contained in Section 5.

2. The Effect of product market regulation on macro performance: Channels and related micro evidence

In this section we start from a discussion of a few theoretical contributions that help us in understanding the complex links that exist between product market regulation and economic performance. We then review selectively micro-econometric studies for individual countries that either address the relationship between competition and performance or discuss the consequences of specific episodes of regulatory reform.

2a. Theoretical considerations

Product market regulation affects the overall performance of an economy in several ways (see Griffith and Harrison (2004)). It has an impact on the allocation of resources between sectors producing different goods and between firms with different productivity within each sector. Moreover, it affects the productivity of existing firms. Finally, it has an impact on the pace of productivity growth by altering the incentives to innovate and by determining the speed with which new products and processes replace old ones.

When reforms lead to more competitive output markets, the wedge between prices and marginal costs is reduced and the allocation of goods and resources, in the absence of other distortions, will become more efficient in a static sense: more competitive markets will allocate capital and labour more efficiently to the production of those goods that consumers value more. Even more importantly, a more competitive climate will lead to pressure for the less efficient firms to exit and market shares will shift from lower to higher productivity firms, leading to a more efficient allocation of factors of production.

Blanchard and Giavazzi (2003) discuss the effect of product and labour market regulation on employment and wages in the context of a model of identical imperfectly competitive firms for whom labour is the only factor of production and both the product and labour markets are non competitive. In that model, an increase in product market reform is modelled either as an increase in the degree of substitutability between goods or as a decrease in entry cost.

The effect of product market reform may differ between the short run and the long run. An increase in the degree of substitutability between goods leads in the short run, for a given number of firms, to lower mark-ups, increased employment and higher real wages. However, there is no effect in the long run, because the reduced mark-ups lead to firms' exit. Product market reforms that lead to a decrease in entry costs have, instead, long run effects as well. The entry of new firms will be associated to a lower mark-up, higher employment and real wages. The fact that only policies that affect the cost of entry have

long run effects, and hence are the ones that should receive the greatest attention, is one of the main policy implications of the paper.[1]

Another class of models allows for heterogeneity between firms. Bernard, Eaton, Jenson, and Kortum (2003) and Melitz (2003) focus on external barriers affecting the product market and are based on the assumption of heterogeneity in productivity. These papers allow for entry and exit of firms and show that a lowering of trade barriers generates a reallocation of resources in favour of more productive firms. The exit of low productivity firms and the expansion in the domestic and foreign market of higher productivity firms gives rise to aggregate productivity growth.[2] Bergoeing, Loayza and Repetto (2004) also allow for idiosyncratic heterogeneity differences in productivity and focus on how the effect of a negative aggregate productivity shock depends upon government induced rigidities in the reallocation of resources, modelled as a subsidy to existing firms. Simulation exercises show that the existence or the introduction of such subsidies increases the length of the period in which aggregate output is below potential and generates greater cumulated output losses.[3]

Product market reforms also have a direct effect on the productive efficiency of existing firms. Greater competition may increase the incentives to reduce X-inefficiencies and organize work more efficiently. The theoretical literature is immense and, while agency models of managerial behaviour can rationalize why greater

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[1] The effect of labour market reform, captured by a decrease in workers' bargaining power in a Nash cooperative bargain, will lead to a decrease in the real wage in the short run, but to an increase in employment and an unchanged real wage in the long run.

[2] For recent micro evidence on foreign competition and trade reform see Pavnick (2002), Harrison and Revenga (1995), Harrison (1994), Levinsohn (1993). For cross country evidence on trade liberalization see Rodriguez and Rodrick (2001), Vamvakidis (2002), and Yanikkaya (2003).

[3] Cross sectional cross country evidence supports the existence of a positive relationship between cumulated GDP losses and the stringency of regulation, controlling for the volatility of shocks affecting the economy, captured by the standard deviation of the terms of trade and of domestic inflation.

competition tends to reduce slack, this conclusion is by no mean unambiguous. The channels of transmissions are manifold (Nickell, Nicolitas, and Dryden (1997)). First, in a more competitive environment it may be easier for owners to monitor managers because there are greater opportunities for comparison which can lead to better incentives. Second, it is plausible that an increase in competition will increase the probability of bankruptcy and managers will work harder to avoid this outcome. Third, in more competitive markets characterized by higher demand elasticity, a reduction in costs that allows firms to lower prices will lead to a larger increase in demand and, potentially, profits.

Changes in ownership from public to private may also have important effects on the incentives for managers and workers to reduce slack. Whether or not that happens crucially depends upon the market structure after privatization. One must be careful, in general, not to equate privatization or deregulation automatically with an increase in competitive pressure, particularly in sectors where increasing returns creates incentives for the emergence of natural monopolies.

There are several principal agent models that study the effectiveness of incentives and its dependence on the number of players. One of the papers that address more directly the link between competition and performance is the model by Hart (1983).[4] In that paper a fraction of firms are run by managers who respond only partially to monetary incentives, in the sense that they care only whether or not their income exceeds (or not) a minimum level. The resulting optimal contract could be to pay managers this minimum provided firms' profit exceed a given floor (that can be interpreted as the bankruptcy level), and zero otherwise. In this situation, any shock that induces profit maximizing firms to reduce costs will be transmitted, via lower equilibrium prices, to non-profit

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[4] See also Holmstrom (1982), Nalebuff and Stiglitz (1983), and Mookherjee (1984).

maximizing firms. Their managers will also try to reduce costs in order to avoid bankruptcy and preserve the utility derived from being in control of the firm. This will lead to an increase in the level of productivity in the economy.

However, if we allow managers to respond to monetary incentives, the effect becomes ambiguous. Greater competition increases the threat of bankruptcy, which is a disciplining devise, but at the same time reduces profits in equilibrium, and with it, the possibility to provide monetary incentives to managers (Scharfstein (1988) and Schmidt (1997)).

Product market reforms may affect not only the level of productivity, but also its growth rate through the effect that greater competition has on the incentives to introduce new products or processes that replace the existing ones. The view by Schumpeter (1942) of growth as a process of creative destruction, in which the introduction of new processes and products is associated with the destruction of old ones, underlies many recent papers, such as the endogenous growth models of Aghion and Howitt (1992) and Grossman and Helpman (1991) and the contributions by Caballero and Hamour (1994), (1996), (1998). Impediments introduced by product or factor market regulations to reallocation of factors of production away from low return activities to high return ones may have adverse effects on an economy's aggregate performance. In endogenous growth models, for instance, product market regulation may be seen as increasing the cost of introducing an innovation.

However, things are not as simple and there are contrasting forces at work. In Schumpeter the expectations of monopoly profits provide the crucial incentive for innovative activity. A decrease in monopoly profits following regulatory reform may,

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therefore, decrease the pace of innovation and therefore growth. In addition, the degree of market power also affects the ability to innovate since it allows the accumulation of internal financial resources that can be used to finance innovation. These internally generated funds are crucial in the presence of information asymmetries that may make it difficult or expensive to obtain external funds for innovation activities. Indeed in the early quality ladder endogenous growth models by Aghion and Howitt (1992) and Grossman and Helpman (1991) and in the product variety model by Romer (1990) a reduction in rents generated by regulatory changes would adversely affect the incentive to innovate and, hence, decrease steady state growth. [5] Both product variety and quality ladder models, moreover, typically exhibits scale effects in the sense that larger economies with more resources that could be devoted to research grow faster in the steady state.[6] In this context, product market reform in the form of trade liberalization could have ambiguous effects on growth, since the positive scale effect is counterbalanced by the (negative) effect generated by smaller rents that accrue to innovators.

Note that whereas in the product variety models the decentralized growth rate tends to fall short of the one chosen by the social planner, in quality ladder models of creative destruction this may or may not be the case, basically because the benefits of faster technological progress must be traded off against the losses in rents by the monopoly producers that are displaced. Similar ambiguities in terms of welfare implications appear in models in which relationships are characterized by specificity that

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[5] Regulatory reform can be though of as increasing the price elasticity of demand.

[6] However, minor modifications to the cost of introducing an innovation could eliminate this scale effect (Jones (1999)).

generates a hold up problem, such as Caballero and Hammour (1996), (1998). Regulations that make the reallocation of resources costly can lead to technological sclerosis, in which low productivity units are allowed to survive too long. At the same time, they may also cause the reallocation process to be unbalanced, in the sense that the destruction rate is excessive, given the low creation rate, and generates too high unemployment of the factor that appropriates part of the rent.

In the earlier quality ladder growth models referred to above, innovations are made by outsiders and not by the incumbents. In more recent models (Aghion, Harris, Vickers (1997), Aghion, Harris, Howitt, Vickers (2001), Aghion, Bloom, Blundell, Griffith and Howitt (2002)) incumbents are allowed to innovate. In these models, the incentive to innovate depends upon the difference between post and pre-innovation rents. Greater competition reduces both, but the latter more than the former, fostering innovation. Basically, competition may stimulate innovation because entry and the threat of entry provide an incentive to innovate in order to escape competition. This effect should be stronger in industries where competition occurs between "neck-and-neck" firms, i.e. firms with similar production costs. In other terms, competition is more likely to stimulate innovation and productivity growth in sectors or countries close to the technological frontier, while the opposite holds for sectors or countries below the frontier.

Finally, there can also be another channel through which increased competition can have a beneficial effect on innovation and growth. When principal agent considerations such as those in Hart (1983) are inserted in an endogenous growth model, greater competitive pressure can provide an incentive for managers to speed up the

adoption of new technologies in order to avoid bankruptcy and the loss of benefits from control associated with it (see Aghion, Dewatripont and Rey (1999)).

In summary, there are many ways through which product market regulation may have an impact on overall economic performance. Regulatory reform can affect allocative efficiency, the extent of managerial slack, and X-inefficiency in existing firms. Moreover, it can exert an influence on the process of firm dynamics and on the introduction of new products, and hence on aggregate productivity growth. However, at the theoretical level there are sufficient ambiguities or caveats concerning the direction of the effect that empirical research in this area is absolutely essential to come to a convincing conclusion about the overall impact of product market regulation.

2b. Lessons from micro-econometric evidence

A seminal micro-econometric contribution that has important implications for the issues we are discussing here is the paper by Nickell (1996), who uses firm level data for the UK to investigate where changes in competition affects productivity levels and growth rates. Competition is measured in several ways, including measures of monopoly rents, concentration, import penetration, and number of competitors. By estimating a dynamic production function with the competition variables as additional regressors, and allowing for endogeneity of input choices, Nickell finds that greater competition has a positive effect both on the level and the growth of productivity. Note that while firm level variables are instrumented in the context of a dynamic panel GMM approach, competition variables are not. However, if an increase in productivity leads a firm to increase its market share, so that the market becomes more concentrated and less

competitive, this would impart a downward bias to the estimates of the effect of competition on productivity. In this case, the estimated effect represents a lower bound on the true effect of competition on productivity.

The results in Nickell are confirmed by the more recent contribution by Disney, Haskel, and Heden (2000), using a larger data set for UK firms.[7] Klette (1999) extends the approach by Hall (1986), (1988) to estimate market power and concludes, using Norwegian plant level data, that plants characterized by greater market power tend to be less productive. Bottasso and Sembenelli (2001) apply a similar methodology on Italian firm level data and conclude that the EU Single Market Program has lead to a decrease in the mark-up and an increase in productivity for those firms that were expected, *ex-ante*, to be more sensitive to the abolition of external barriers. There are several other micro-econometric contributions that address the effect of regulatory reform and privatization on productive efficiency or productivity growth. Many of these studies focus on the service sector since regulatory changes have been particularly important in utilities, communication, and in the transport sector. We will not review in detail the evidence here, but the overall conclusion is that in many instances there have been productivity gains due to the increased competition. [8]

An important paper on the effect of regulatory reform on the dynamics of productivity is the one by Olley and Pakes (1996) on the evolution of the US

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[7] See also Jaganathan and Srinivassan (2000) for a different way of testing the effect of competition on agency problems, based on the relationship between leverage and profits.

[8] For evidence on the effect of the EU Single Market Program on mark-ups and productivity see also, Gagnepain and Marin Uribe (2003), Goldberg and Verboven. (2001) among others. See also Martins, Scarpetta and Pilaff (1996) on mark-ups in the OECD. For a review see Ahn (2002), pp. 17-18, Ahn (2001), pp. 24-25, and Faini et al. (2005).

telecommunication industry following deregulation. The industry experienced productivity growth that was not reflective of productivity growth in manufacturing. Olley and Pakes use their estimate of production function parameters that control for endogeneity and sample selection to show that improved performance is due to a reallocation of capital to more productive plants. It is the reallocation of output to more productive plants and not an increase in average productivity growth that is behind the increase in productivity at the industry level.

There is indeed considerable debate on the relative importance for aggregate productivity growth of the "within" component (coming from productivity improvement in continuing firms), of the "between" component (due to the reallocation of resources between continuing firms), and of the component due to entry/exit.[9] Note that changes in product market regulation that reduce entry barriers will have an effect on all components. Results on total productivity growth decompositions differ according to the precise formula used, according to whether one focuses on multi-factor or labour productivity, whether one uses employment or product weights, whether they are beginning of period or an average between the beginning and the end of period, and according to the length of the horizon chosen for the calculation. Many estimates of the within component of labour productivity imply that it is the most important component, although its weight varies across studies. Foster, Haltiwanger, and Krizan (1998) show that the contribution of net entry to aggregate productivity becomes important (and positive) only at a 5/10 year horizon, reflecting the increasing share of entering/exiting firms and learning/selections effects. Evidence on the importance of reallocation of market shares from low to high

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[9] See Haltiwanger (2000) and Ahn (2001) for a review. In some decompositions, in addition to the "within", "between" and entry/exit component s there is also a "cross" component.

productivity firms is also mixed. For instance Grilliches and Regev (1995), and Scarpetta, Hemmings, Tressel and Woo (2002) find that it is small, whereas Baily, Hulten and Campbell (1992), and Foster et al. (1998) find it is important.

There is little evidence on the effect of regulatory changes in the product market on productivity growth and other outcomes in developing countries.[10] An exception is Srivastava (1996) who analyzes the effect of the first phase of industrial deregulation in India in 1985, involving a significant degree of de-licensing of entry and expansion and liberalization of intermediate and capital imports. Using production function estimates based on firm level panel data, he shows that the rate of TFP growth for existing firms increased after deregulation. The increase was particularly evident in those sectors with an above average use of imported materials. More recently, Aghion, Burgess, Redding, and Zilibotti (2005), using a panel of industry/state level data, provide evidence that de-regulating entry in India in 1985 and 1991 has not had an identifiable effect on entry, but it has increased the dispersion of output levels across establishments. Moreover, they show that output increases more after product market deregulation if labour market regulation is less restrictive. The interaction between product and labour market reform is an important issue that deserves further investigation.

The empirical results concerning the relationship between innovation and competition are mixed.[11] Most studies, particularly the earlier ones, were conducted at the industry level and they tended to rely on concentration as a measure of competition, which is problematic because measure of concentration does not capture the competitive

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[10] . See Heckman and Pages (2003) on the effect of labour market regulation in Latin America. See also Eslava, Haltiwanger, Kugler, and Kugler (2005) for evidence on the effect of factor market reform on employment adjustment, capital adjustment and productivity using a panel of plants in Columbia.
[11] See Ahn (2002) for a review. See also Geroski (1995)

pressure coming from potential entrants. The overall results are not supportive of the proposition that concentration exerts an unambiguous positive effect on innovation activities.[12]

More recently, Blundell, Griffith and Van Reenen (1999) found, using UK firm level data, that firms with greater market share were more innovative, but that more competitive industries produced more innovation. Recent firm level evidence suggests that the relationship between mark-ups and innovation is non linear and has an inverted U shape, as suggested by the most recent growth models. Aghion, Bloom, Blundell, Griffith and Howitt (2005) use data on listed UK firms for which weighted patents measures of innovation are available. The Lerner index is used as a measure of competition and the problem of its endogeneity is addressed by using as instruments reforms linked to the EU single market, reforms imposed on individual sectors as a result of action by the UK competition authorities, and measures of privatization. The results are supportive of an inverted U shape relationship with innovations being adversely affected by a very competitive or very monopolistic environment. Note that a linear specification would yield a positive relationship between innovation and measures of rents, as suggested by Schumpeter. The results are stronger in neck-and-neck industries, as suggested by the theory.

Aghion, Blundell, Griffith, Howitt, and Prantl (2005) analyze the effect of foreign firm entry on TFP growth and patent counts. Obviously, entry is endogenous and the latter is instrumented with policy and foreign technology variables that are less likely to have a direct effect on the growth of TFP or on patents. Using individual UK firm's data, entry is found to have a positive, significant and sizeable effect on TFP. The effect is

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[12] See Cohen and Levin (1989).

greater when IV procedures are used and it is greater for an industry closer to the technological frontier.

3. Data and methodological issues

In this section, we will review the main data on regulation that are available across countries and that have been used in empirical work. We will also discuss the main stylized fact that can be identified from the data. The available measures of regulation condition the type of econometric evidence that can be produced, and often it represents an important constraint for the researcher. Although there are serious issues in measuring economic outcomes, such as total factor productivity growth or firm's innovative activities, they are arguably not as severe as those affecting the measurement of tightness of regulation.[13]

We also discuss other important methodological issues involved in estimating the effect of regulation on economic activity. The main issue here is to go beyond any observed statistical association between regulation and performance and draw inferences on the causal effect of regulation on economic outcomes.

3a. <u>Data and stylized facts</u>

Product market regulation varies by countries and time and often is industry specific. Moreover, the term "product market regulation" encompasses various dimensions that exert different effects on agents' behaviour. Perhaps the most important aspect one would like to capture is how regulation contributes, directly or indirectly, to

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[13] See for instance Basu and Kimball (1997) on the problems in measuring productivity growth.

the size of entry barriers. However, there are conceptual and practical problems in measuring those dimensions of regulation that are relevant in this respect. Moreover, often the data are not available at the industry-country level, but only at the country level, and/or they are available at only one point in time or at widely spaced intervals.

One of the main data sets used in empirical work is collected by the Fraser Institute and it contains information (in the interval 1 to 10, decreasing with stringency of regulation) on price controls, time spent with bureaucracy, ease of starting a new business, government transfers and subsidies (as a % of GDP), government enterprises and government investment (as a % of GDP), non tariff import barriers, and average tariffs. The indicators reflect a mixture of factual information and perception and are available up to 2000 at five year intervals. After that, they are available at a yearly frequency.

Another useful data set is the OECD Database on regulatory reforms containing detailed information for 1998 on regulations and administrative burdens on existing and new business. For a subset of industries (in the general utility, communication and transport sectors) indices of the importance of barriers to entry, vertical integration, market structure, price controls, and of the importance of public ownership are available on an annual basis from 1975. (The indices range from 0 to 6 and are increasing with the stringency of regulation).[14] For these sectors, the data availability comes as close as possible to what a researcher would want. For the manufacturing no time varying data are available at an annual frequency, except the data on tariff and non tariff barriers and public ownership.

For European countries, one can also obtain further information on the evolution of state intervention in the economy, using the Eurostat data on sectoral and ad hoc state

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[14] See Nicoletti, Bassanini, Ernst, Jean, Santiago, and Swain (2001), and Nicoletti and Scarpetta (2003).

aid (% of GDP), public procurement (as % of GDP), and openly advertised public procurement (% of procurement) for the nineties. Another useful source of data is the European Centre for Public Enterprises with Public Participation (CEEP) that provides information on the share of public enterprises in the business sector at 4/5 year intervals.

As we have seen, there is greater data availability on various aspects of product market regulation for developed countries. An important source of information that covers developing countries and transition economies as well is the World Bank "Doing Business" database. It contains information on the ease of starting a new business, including the number of procedures, the time involved, and their cost. The data set is based in part on, and expands, the design in Djankov, La Porta, Lopes de Silanes, and Shleifer (2000). It also provides useful information on other dimensions of the business environment, such as dealing with licenses, hiring and firing workers, closing a business, paying taxes, etc. Unfortunately these indices are available only for the period 1996-2002 at a biannual frequency, and lack industry details.

What are the main stylized facts about product market regulation that can be identified from the data sets we have described? First, regulatory burdens vary widely across the world. In particular, regulation tends to be more stringent in poor countries compared with richer countries. There is also evidence that it is greater in countries with a French legal origin or with a socialist legal origin. Second, the dispersion of regulatory regimes is greater in developing countries relative to developed countries. Third, there has been a generalized tendency towards the relaxation of regulation concerning entry. This has been accompanied by a decrease over time in tariff and non-tariff barriers to trade in manufacturing. Fourth, OECD countries have experienced substantial

deregulation in services, in sectors such as telecommunication, utilities, and transport. The timing and extent of regulatory reform has varied considerably, with the US, the UK, and New Zealand moving earlier and more decisively compared to countries such as France, Italy and Greece. Finally, often regulatory reform has been accompanied by privatization, so that there has been a tendency for the share of output produced by public enterprises to decrease.

3b. Methodological issues

The main methodological issue facing researchers working in this area is to go beyond any observed statistical association between regulation and performance and draw inferences on the effect of regulation on economic outcomes. In doing so, it is important to control for observed and unobserved factors that have an effect on performance independently from the regulatory environment. Most papers make a serious effort in controlling for observed factors. The main issue involves unobserved heterogeneity.

If outcomes are measured at the industry level and the type, level and change in regulation is also industry specific, the availability of time varying industry specific indicators allows one to control for time invariant country and industry effects. It can also allow one to control for factors that vary over time and are common across sectors, like technological innovations or knowledge that are widely accessible by all countries or common macro shocks. If the time varying information on regulation is only country specific, but there continues to be time varying industry specificity in regulation, the measurement error problem may bias the coefficient on regulation towards zero and make

it more difficult to detect the true effect of regulatory changes. At a minimum, it would be desirable to distinguish between regulation in manufacturing and in service industries. Yet, in the case that common regulatory changes are dominant, time varying indices at the country level are useful in that one can control, at least, for country and sector specific time invariant characteristics.

If the time dimension is not available, industry variation in the product market regulation indicators is still helpful, because, at least one can control for additive unobserved country and industry specific effects (but not for country specific industry effects). All the identification in this case comes from cross-sectional country/sector variation in the data.

However, often one has available information that varies only by country, with no industry specificity. This makes it very hard to distinguish the effect of product market regulation from other country specific unobservable effects. In assessing a country's aggregate performance, some mileage here can be gained by using interaction effects with other variables that vary by country and time. For instance, one may believe that the effect of regulation may be different depending upon circumstances such as distance of a country from the technological frontier, etc. The lack of identification of the main effect of regulation from other country specific effects remains.

A distinct, and less relevant problem in this area of research, occurs when one only has country specific information on regulation even if the latter is truly the only one that matters because there is no industry specificity, yet one uses outcomes at the industry level as a dependent variable. Moulton (1990) points out that standard errors for the coefficient of the variable (regulation) that varies only by country can be seriously

underestimated when the error terms are contemporaneously correlated across industries within countries. The severity of the problem and the appropriate solutions is related, among other things, to the number of groups (countries in our context). If the number of groups is large, things are simpler, although one has to take into account the potential contemporaneous correlation in the error term across sectors within a country. Things are more complicated if the number of groups is small (see Wooldridge (2003) for an overview).

Another, more important, issue is the potential endogeneity of regulation itself, even if one controls for country and industry time invariant effects. Regulation may indeed reflect the economic performance of a country or of an industry. It is difficult to say a priori in which direction the bias would work. For instance, negative macro shocks, particularly if prolonged, can enhance the probability of reforms because the unsatisfactory nature of the status quo weakens opposition to reform. However, it may be easier to introduce reform in good times because their negative impact on particular groups may be smaller and/or there are more resources to compensate the losers. In the first case, OLS or Within estimators may lead to an underestimate of the true effect of reform, in the latter case, such effects will be overestimated. Recent empirical evidence for OECD countries suggests that poor growth experience in a given year (or in the recent past) leads to less regulated output markets.[15] Similar results hold for trade reform, but, interestingly, not for financial or labour market reform.[16] No systematic evidence is available for developing countries, although it is not unreasonable to conjecture that similar patterns may be observed for product market and trade regulation. The result of

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[15] See IMF economic Outlook, 2004, ch. III "Fostering Structural Reforms in Industrial Countries".
[16] A contemporaneous bad year increases labour market regulation and past weak growth is associated with tighter financial regulation.

all this is that there is the risk of underestimating the effect of product market reforms, since the outcome variables one is interested in are generally procyclical, including standard measure of productivity.

4. Product Market Regulation and Economic Performance: Review of Cross Country Evidence

In this section, we will review a set of recent contributions that have a direct bearing on the effect of product market regulation on various aspects of macroeconomic performance. The review will be selective and focus on papers that provide cross country evidence. In many cases, researchers have adopted a reduced form approach and have entered measures of regulation as an explanatory variable in equations for factor demand, productivity or innovation. In other cases, the effect of regulation is mediated through its effect on an intermediate variable, such as the mark-up or firms' entry, exit, and turnover rates. We will start from reviewing the evidence on the effect of regulation on these "intermediate" variables, and we will then discuss the effect of regulation on the ultimate outcome variables, such as investment, employment, innovation, productivity, and output growth.

4a. <u>Transmission mechanism: Effect on mark-up and firms' entry/exit/turnover</u>

Griffith and Harrison (2004) is a good example of the two step strategy. In the first step, they first estimate the effect of product market reforms on the level of rents, measured by the ratio between value added and the sum of labour and capital costs. The

effect of variations in the mark-up on factor accumulation R&D and productivity is estimated next, using product market reforms as an instrument for the clearly endogenous mark-up. The implicit assumption is that product market reforms affects the economy only through mark-up variations and not directly. They only use regulations that vary with time across countries in order to be able to control for cross- sectional unobservable differences that are relatively constant over time. The indicators of product market regulation are the Fraser Institute index of ease of starting a new business, of price controls, of time spent with government bureaucracy, average tariff rates, of regulatory trade barriers, the European Center of Enterprises with Public Participation, and the Eurostat Structural indicators on state aid, on public procurement, and on the percentage of it that is publicly advertised. The indicators are interpolated or extrapolated if not available for each year and are entered separately in the equations. Both in the mark-up and factor demand equation they control for country specific cyclical factors. Their results suggest that many of the indicators measuring tightness of regulation have a significant positive effect on mark-ups, as one would expect. The effect of variations of mark-ups on various economic outcomes will be discussed below.

Several authors extend and modify the two step approach found in Griffith and Harrison (2004), by choosing a different intermediate variable to focus on. Cincera and Galgau (2005) estimate first the effect of regulation on entry and exit of new firms and then the effect of entry and exit on factor demand and productivity. Loayza, Oviedo and Serven (2005) use firm turnover rates (the number of exiting and entering firms divided by the total number of firms) as the intermediate variable and investigate its effect on productivity growth and its components. Scarpetta, Hemmings, Tressel and Woo (2002),

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Brandt (2004) and Klapper, Laeven, and Rajan (2004) present results on the effect of regulation on entry, but do not investigate the relationship between entry and other economic outcomes.

Data sources for entry and exit rate vary across studies. The entry and exit rate variables in Cincera and Galgau (2005) are taken from the DUN & BRADSTREET data base on the number of entries and exits for 352 digits sectors for 9 OECD countries. The data on firm dynamics in Loayza et al. cover six Latin American countries and nine industrial economies and are taken from the harmonized data set on firm dynamics constructed by Bartelsman, Haltiwanger and Scarpetta (2004). The entry and exit rates in Scarpetta et al. and Brandt are taken, instead, from the OECD firm level data base constructed from business registers or social security databases. Klapper et al. (2004) use the cross country firm level Amadeus data set to construct entry rates for Western and Eastern European countries. In most cases the time dimension of the data on entry and exit tends to be rather short.[17]

The results obtained by Cincera and Galgau, using the first principal component of the Fraser Institute and the within estimator, suggest that deregulation tends to be significantly associated with more entry and exit.[18] When the coefficient on regulation is allowed to differ across sectors the results are not tidy, with the sign and significance varying across sectors. Similarly, allowing for country variations, suggest heterogeneity of responses that are not easy to rationalize.

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[17] For instance, the data for firm demographic refer to the period 1997-2003 for most countries in Cincera (2004), and to 1998 and 1999 in Klapper et al. (2004). In Loayza et al (2005) the period is somewhat longer (1990-2001).

[18] In the estimating equation, the author controls for lagged entry, capital and R&D intensity as a measure of barrier to entry, and other market structure variables, as a measure of opportunities, in addition to year, country and sector effects. Note that the use of the within estimator even in a dynamic equation with short T is not appropriate.

Scarpetta et al. (2002) use as explanatory variable, the time invariant OECD indicators, either country or country/sector specific. When only country level indicators are used, one obviously cannot control for country specific effects. When industry/country specific indices are used, the authors control for country and industry additive effects. The more convincing results are those in which they control for country and sector effects in the specification also including employment protection indices. Product and labour market regulations indices are interacted with firm size dummies. There is evidence that for firms from 20 to 99 workers product market regulation has a negative and significant effect on entry. For the 100 to 499 class the effect is positive and significant, which is somewhat puzzling.

The results by Brandt (2004) are obtained using country specific time invariant measures of barriers to entrepreneurship as the explanatory variable in an equation in which the dependent variable is the averaged residual (across sectors and time) of a regression of entry rate on industry, time dummies, and country specific ICT industries dummies. The focus on barrier to entry is motivated by the fact that some of its subcomponents are the only ones to have some explanatory power. This is not true for indicators summarizing state control and barriers to trade and investment. The barriers to entry coefficient is not significant, however there is some evidence that its subcomponent representing regulatory and administrative opacity has some explanatory power for entry rates.

Klapper et al. (2004) focuses on the interaction effect between regulation and the "normal" rate of entry in an industry, proxied by the corresponding entry or turnover rate for the US. The drawback is that one cannot make a statement about the overall effect of

regulation on entry, but only on relative magnitudes. The advantage is that this approach should be less affected by reversed causality problems, whereas in countries with generally low entry there may be less pressure to eliminate restrictive regulations. The results suggest that regulation reduces entry relative to the "normal" industry specific rate one observes in a country (the US) with low barriers to entry. [19]

Loayza et al. (2005) emphasizes that the extent of firm dynamics depends also upon the volatility of the shocks affecting each country. In particular, they include in the equations for entry, exit and turnover the triple interaction between regulation, normal turnover (in the US), and the standard deviation of terms of trade growth. In this case, the question is whether economies react differently to shocks depending upon the nature of each sector and the nature of country level regulation. [20] The evidence is supportive of the idea that product market regulation slows down the reallocation of resources following a shock.

Considering all the empirical contributions on the relationship between regulation and firm dynamics together leads to the conclusion that regulatory barriers in the product market have a negative effect on firm's entry or turnover and are likely to slow the process of reallocation of resources.

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[19] Klapper et al. use the time invariant measures on barrier to entry in Diankov et al. (2002). The equations contain also country, industry, size and year effects. In one specification regulation is instrumented by country of origin, with no fundamental change to the results.

[20] Loayza et al. construct a time invariant summary measure of regulation based on information from the World Bank, the Heritage Foundation, and the Fraser Institute. The statistics for firm demographic cover the period 1990-2001, while productivity refers to the 1988-200 period. The equations contain also country, industry, size and year effects. The paper also studies the effect of labour market regulation and fiscal burden.

4b. Effect of product market regulation (PMR) on fixed capital and labour demand

Alesina, Ardagna, Nicoletti, Schiantarelli (2005) uses country/sector time varying information on regulation to assess its effect on capital accumulation by introducing regulation indicators directly in an investment equation. Understanding the behaviour of investment is very important for many reasons, including the fact that often process innovations are embodied in new capital goods. The theoretical model that underlies their contribution is an extension of Blanchard and Giavazzi (2003) that assumes perfectly competitive labour markets but introduces capital as a factor of production that is costly to adjust. Product market regulation affects the size of the mark-up by altering, for instance, entry barriers. Moreover regulation can influence the cost that even existing firms face when expanding their capital stock.[21] Regulatory reform that generates a decrease of the mark-up or in the cost of adjusting capital is shown to lead to an increased demand for capital. There may be however contrary forces at work. For instance, regulation may impose a ceiling in certain sectors on the rate of return. If such a ceiling is binding, a removal of the constraint may reduce the demand for capital. Moreover, deregulation has sometimes been accompanied by privatization. The reduced importance of a dominant publicly owned player facing a soft budget constraint is equivalent to a reduction in entry barriers. However, public enterprises may have been heavy investors, either because of a political mandate imposed of them or because of their incentives to over expand either because they are empire builders or because they want to maximize political support.

In their empirical work Alesina et al. focus on investment in non manufacturing industries (utilities, communications and transport) in OECD countries that have

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[21] The model allows for quadratic adjustment costs in capital.

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experience profound changes, particularly in the 90's, in their regulatory framework. They use time varying sector-country specific measures of regulation collected by the OECD for the period 1975-1998. In their investment equation, they allow for a sector-country specific fixed effect and, in some specification, for a sector specific time trend. This is very important because one needs to control for those sector specific technological shocks that were occurring at the time of regulatory reform and to which reform itself may be responding.

The overall results suggest that a reduction in regulation, particularly if it affects barriers to entry, has a significant and sizeable positive effect on investment. The results are robust with respect to the inclusion of several country or sector specific controls and to estimating the model in difference by GMM, where the regulatory index is also instrumented with lagged values of itself, with population, GDP per capita, cumulative years of left wing government, and union density (see Djankov et al (2002) on the determinants of regulation). When the specification also includes measures of public ownership, the effect of a reduction in entry barriers remains significant. The coefficient of indices of public ownership is also significant, and its sign suggest that privatization has a positive effect on investment. Finally, there is evidence of non linearities in the sense that more decisive and deeper deregulations have a greater marginal impact. Note that the positive effect of deregulation on investment not only reflects a static reallocation of resources, but may also have growth effects, if new technologies are embodied in new capital goods.

Evidence on factor demand is also provided, using the two step approach by Griffith and Harrison (2004), via the mark-up, and by Cincera and Galgau (2005), via

entry. After showing that a decrease in regulation leads to a significant decrease in the mark-up, the results in Griffith and Harrison suggest that the mark-up is negatively and significantly related to employment and investment (see below in 4d for the effect on R&D and productivity). However, in both cases the test of over-identifying restriction strongly rejects the model, meaning that some of the regulation indicators have a direct effect on employment and investment, besides having an effect through the mark-up. Taking account also of their direct effect leads to the conclusion that the more important effect on labour and investment comes from the average tariff rate (negative), from price controls (negative), and from the CEEP measure of the importance of public enterprises (negative). Re-estimation of the employment and investment model reveals that services are responsible for the conclusion that an increase in competition stimulates factor demand, while this is not true for manufacturing.

Cincera and Galgau (2005) use firm entry and exit rates as the intermediate variable through which regulation affects various aspects of performance. Obviously, the entry and exit rates are endogenous and need instrumenting.[22] The instrument chosen by Cincera and Galgau are current and lagged values of the first principal component of the Fraser indices and an index of restrictions on FDI investment, which vary only by country and account only for a portion of the industry level variation of entry. For this reason, current and lagged values of the number of active, entering, and exiting firms are used as additional instruments, which is a more questionable choice. Lack of rejection by the Sargan test of the over-identifying restrictions is not reassuring. If anything, it reminds us of the low power of the test in many circumstances, particularly when many

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[22] Brandt (2004) also present correlation between entry and measures of economic performance, but given the endogeneity problem, it is difficult what to make of them.

of the instruments have a low explanatory power in the first stage regression. Be that as it may, the results suggest that entry is not a significant determinant of the growth in investment, while exit is associated with a significant decrease in the pace of capital accumulation. For employment growth, the effect is not significant or of different sign at different lag lengths of entry, but with a close to zero net effect.

Summarizing, the direct evidence in Alesina et al. (2004) and the indirect one, via effects on the mark-up in Griffith et al (2004) suggest a positive effect of deregulation on investment and employment in the service sector. For manufacturing, there is no evidence of a positive (or for that matter, negative) effect. The results in Cincera and Galgau (2005) suggest that entry is not a key channel of transmission of regulatory changes to the reallocation of labour and capital.

4c. Effect of PMR on innovation

Bassanini and Ernst (2002) present direct evidence for 18 manufacturing industries in 18 OECD countries on the effect of product and labour market regulation on R&D intensity (relative to output). R&D is used as an input based measure of innovative activities by a firm. The advantage of this measure is the fact that it is more easily available than other measures such as patent counts. The drawback is that R&D is not the only input in the innovation process and, even if it were, R&D intensity may not capture changes in its effectiveness. Finally, not all innovative efforts are measured by formal R&D spending. The regulation variables are the OECD country level time invariant measures of domestic economic regulation (state control, legal barriers to entry, price controls) and administrative regulation (administrative barriers for new firms,

permit and licensing systems), in addition to time varying indicators of tariffs and non-tariff barriers. A measure of protection of intellectual property rights is also included. Controls include industry and country dummies in addition to employment share of large firms and import penetration. As a result, the main effect of the time invariant indices of regulation cannot be estimated, only its differential impact across some cut in the data (high tech versus low tech industries in this case).

The results suggest that non-tariff barriers have a negative effect on R&D intensity. No effect of tariff barriers is detected, although one wonders whether the presence of the import penetration variable as a regressor or the lack of variation of this indicator across EU countries may be responsible for this result. There is no evidence of a differential effect of domestic or administrative barriers comparing low tech to high tech firms. In contrast, there is a positive differential effect for employment protection in high tech industries relative to low tech in centralized systems of industrial relations. Note however that the high tech-centralized IR system interaction has a negative coefficient.

Griffith and Harrison (2004) analyze also the effect of (time varying) product market regulation on R&D through changes in the mark-up. Even allowing for a quadratic term, for virtually all countries the mark-up has a positive and significant effect on R&D. Also, in this case, the test of over-identifying restrictions suggests that some of the indicators should be included directly in the equation. The results suggest that a lower tariff rate, fewer barriers to starting a business, and lower regulatory trade barriers are associated with lower R&D in the business sector. The results obtained for the manufacturing sector are similar. However, they are very sensitive to the inclusion of Finland in the sample. When Finland is excluded, one obtains a strong inverted U shaped

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relationship between R&D spending and the mark-up, with some countries such as France, Italy and the Netherlands mostly on the downward sloping section. The sensitivity of the results to country sample selection deserves to be investigated further.[23]

Cincera and Galgau (2005) finds a negative effect of entry on R&D intensity that is significant at the 10% level. Recall that entry is negatively related to the tightness of regulation. The effect on the R&D spending growth rate is significantly positive contemporaneously and negative after one year. The net effect is close to zero.

Summing up, the cross country studies are not supportive of a strong positive effect of lower regulation on direct input measures of firms' innovative activities. Actually, the evidence suggests that lower mark-ups associated with product market reform lead to lower R&D for most countries. However, this evidence is sensitive in manufacturing to the particular sample of countries selected for estimation.

4d. Effect of PMR on output and productivity and output growth.

There are several papers that address the relationship between product market regulation and performance. In an early contribution, Koediik and Kremers (1996) find a negative cross sectional relationship between per capita GDP growth or TFP growth and product market regulation in 11 European countries. More recently, using the economic freedom index published by the Fraser Institute and averaging data over five year periods, Card and Freeman (2004) fail to find a significant effect of regulation on the level of

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[23] Very recent empirical work conducted at the Institute for Fiscal Studies and still in a draft stage confirms that the inclusion or exclusion of Scandinavian countries affects deeply the shape of the relationship between the mark-up and innovation. I thank R. Griffith for useful comments and information on this point.

output per capita (or per worker) or on its growth rate, once they control for year and country effects[24].

Nicoletti and Scarpetta (2003) provide perhaps the more detailed empirical contribution on this issue. They focus on the effect of regulation on total factor productivity growth, using cross country data for several industrial sectors and including the regulatory variable directly in the productivity equation. Their approach is inspired by the contribution by Griffith, Redding, and Van Reenen (2004), (2003) who use an endogenous growth model to rationalize both a direct effect of R&D on growth through its effect on innovation creation, and an indirect one through the absorption of new technology. The importance of the indirect one depends positively upon the distance from the world frontier of each industry. The authors substitute R&D with their measure of product market regulation and also allow for a direct and indirect effect.[25]

The productivity measure is calculated for 17 manufacturing and 6 service industries for 18 OECD countries. Three sets of results are presented. In the first one the authors use the wide coverage, but time invariant country level measures of liberalization collected by the OECD in 1998 (which is towards the end of their sample period). The regulation variables are not significant on their own in regressions that do not (cannot) include a country effect. They are significant when interacted with the technology gap in an equation that still lacks country effect (which could have been used instead of the insignificant time invariant indicators). The lack of country effect and the time invariant character of the measures raise doubts about these results.

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[24] The only significant effect is on employment growth.
[25] Note that the results for the effect of regulation on productivity in Nicoletti and Scarpetta (2003) subsume and extend the ones in Scarpetta , Hemming, Tressel and Woo (2002).

The time varying measures of privatisation are introduced on their own and they tend to have a positive and significant effect on productivity growth. When a time varying measure of liberalization based on information in seven service sectors is introduced, the privatization index becomes not significant, while the time varying measure of regulation is significant and positive. The problem here is whether the regulatory reforms for the service sector can be used for the economy as a whole, which is potentially problematic.

In another set of results, a time varying measure of entry liberalization in manufacturing, based on data on trade liberalization, is used in conjunction with the time varying measure of liberalization in the service sector. In that case, basically no significant direct or indirect effect can be detected. Only when liberalization in manufacturing is redefined as the average of trade liberalization and entry liberalization in non manufacturing, one observes a significant direct positive effect of deregulation on TFP growth.

Finally, the 1998 time invariant sector specific OECD measures of liberalization are combined with the time varying measure of liberalization for manufacturing and for services. The equations contain country, industry, and year dummies. The results suggest that entry liberalization in services has a positive effect on productivity growth. The only significant interaction is the one between entry liberalization in manufacturing and the technology gap. Privatization continues to have a positive direct effect on productivity growth.

Summarizing, there seems to be some evidence of a positive effect of privatization and entry liberalization on TFP growth, particularly for the service sectors.

There is also some evidence that entry barriers in manufacturing may affect the pace of technology absorption, especially for countries that lie away from the world frontier.

Additional evidence on the effect of regulation on per-capita GDP growth for industrial countries is contained in chapter III of the IMF World Economic Outlook (2004), while Loayza, Oviedo, and Serven (2004) is one of the very few papers that looks at the effect of regulation on the economic performance of a wide set of countries, including developing countries. The IMF studies concentrates on fifteen developed countries with a maximum of five observations on growth rates calculated over three years' averages. The estimated equation contains standard controls for cross country growth regressions and a menu of structural policy indicators, including (present and lagged) values of the time varying average product market regulation indicator developed by the OECD for seven non-manufacturing sectors, and average effective tax rates. The sample size is therefore small and the product market regulation indicator captures only a subset of the economy. The model is estimated by GMM dynamic panel data methods and suggests that both product market reform and trade reform have a positive and significant effect on growth, although it may take time for the full effects to be realized.

The main challenge when dealing with developing countries is the availability of detailed indices of product market regulation that reflect the cross sectional and time variability of product market regulation, although some of them, such as tariff barriers, are available at annual frequency and the indices of the Fraser Institute at five year intervals for many countries. The Loayza et al (2004) paper focuses on time invariant indices constructed from information from the World Bank, the Heritage Foundation, and the Fraser Institute and are meant to capture the fiscal burden, and product market

regulation, the latter a composite of entry, trade, financial markets, bankruptcy, and contract enforcement indices. An index of labour market regulation is also constructed.

The indices are used as regressors in standard cross sectional average growth regressions for output per capita over the 90's, allowing their effect to depend on an index of the quality of governance. Their effect on output volatility is also considered. The inability to control for country specific unobserved effects and the time invariant nature of the indices over a period that witnessed substantial change is the main limit of the exercise. The effort made by the authors to instrument for regulation itself and the fact that they allow for an interaction with the quality of governance are two attractive features, together with the focus on a sample including developing countries. [26]

The results suggest a negative and significant direct effect of product (and labour) market regulation on growth, but the coefficient of the interaction with governance is significant (except for the fiscal burden index), and its sign suggests that better governance reduces the negative effect of regulation. Actually, the size of the coefficients are such that the overall effect of regulation is sizeable and negative for most developing countries, while it is zero or even mildly positive for countries with quality of governance similar to the US and the UK (and presumably other OECD countries). The results for macroeconomic volatility are similar: regulation increases volatility, but the effect is attenuated by good governance. Note that these results, obtained by introducing the interaction with governance, contrast with those that find a positive effect of product market reform on growth for industrial countries.

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[26] Legal origin, fraction of the population that speaks a major European language and initial per capita GDP are used as instruments. The test of over-identifying restrictions does not suggest misspecification. Concerns about the power of such test should, however, not be forgotten.

Griffith and Harrison (2004) also present evidence for the effect of regulation on productivity for developed countries, using their two step approach, where the intermediate link is the mark-up. When the level or the growth rate of labour or total factor productivity in the business sector is regressed on the mark-up (the latter instrumented by the regulatory variables) they tend to find a <u>positive</u> and significant effect of the mark-up on both the level and growth rate of productivity. The conclusion that a higher mark-up has a mostly positive effect on productivity is not altered by allowing for non linear effects of the mark-up or by the direct inclusion of some regulation indices in the regression. A possible explanation is that the new jobs created by deregulation are in lower productivity sectors. Note in this respect that the mark-up coefficient is negative and larger in absolute value in the service sector. An alternative explanation is that the time period available for estimation does not allow one to capture the complexity of the relationship between mark-up and productivity. For instance, the new firms that enter following a reduction in regulation may be initially less productive than incumbent surviving firms and it may take time for them to achieve higher levels of productivity. It is interesting to note that the positive relationship comes from the within variation in the data. If one does not include country dummies in the regression, allowing the between variation to play a role as well, the relationship between mark-up and productivity tends to become negative and significant.

Cincera and Galgau (2005) present results on the effect of entry and exit on output growth and labour productivity growth instrumented with regulation and other variables. Note that the coefficient of entry does not capture only the direct effect of entry on productivity, but also the indirect effect that entry has on the productivity of existing

firms. There is some evidence at the 10% level that entry has a positive effect on labour productivity growth, while exit has a significant positive effect on it at the 5% level.

Loayza et al (2005), use a similar two steps approach to explain labour productivity growth in manufacturing for their subset of developed and developing countries , using turnover (divided by the standard deviation of terms of trade growth) as the intermediate variable. Standardized turnover is interacted with the average US turnover and it is instrumented by product market regulation, labour regulation, and fiscal burden. Average GDP per capita, the average growth rate of the terms of trade, and the output gap over the period are included as controls. Although the regulation variables are time invariant, so that the authors cannot control for unobserved heterogeneity, an interesting twist in their contribution is the decomposition of productivity growth into the "within" component, the "between" component and a component representing the portion of productivity growth due to entry and exit. A specification in which each regulatory variable is included directly in the productivity equations is also estimated by OLS. The overall results suggest that the portion of turnover explained by business regulation flexibility has a positive and significant effect on overall labour productivity growth. However, the only component that is significantly affected is its net entry component.

In summary, most of the studies that include measures of regulation directly in the regression (alone or interacted) tend to find a negative effect of tighter regulation on total factor productivity or per capita output growth. The results for TFP growth are strong particularly in the service sectors, while the effect on the level of governance on growth needs to be investigated further. However, studies that use the mark-up as the channel of

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transmission find that decreases in the mark-up associated with deregulation are associated with lower productivity growth (or level).[27] Controlling for the mark-up, there is no evidence of an additional positive direct effect of deregulation on productivity (sometimes the opposite is the case). The cross-sectional dimension of the data suggests that countries with higher mark-ups have lower productivity growth rates, but one has to be aware that in this case we are not controlling for other country effects besides their competitive environment. On balance, relying on turnover or entry as the variable through which the effect of deregulation is transmitted suggests a positive effect of lowering regulatory burdens on overall productivity growth, but more work is needed in order to understand how that is distributed between the within, between and entry/exit components. The general conclusion that can be drawn at this point is that most, but not all, the evidence points towards a positive effect of less stringent regulation on productivity growth.

5. Summary and Conclusions

What are the overall lessons that can be derived from this review of the available cross country evidence on the effect of product market regulation? We have certainly learned a lot from the recent econometric work in this area, but there is still ambiguity on some of the issues.

There is considerable evidence that product market regulation that raises barriers to entry contributes to higher mark-ups. Moreover, the results support the conclusion that

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[27] Note that higher mark-ups are associated also with more R&D spending.

regulatory barriers in the product market have a negative effect on firm's entry or turnover and are likely to slow the process of reallocation of resources.

As far as factor accumulation is concerned the direct evidence and the indirect one, via effects on the mark-up suggests a positive effect of product market deregulation on investment and employment in the service sector. The result for investment is particularly important because often new processes are embodied in new capital goods and find their way into the economic systems through the investment process. For manufacturing there is no evidence of a positive (or for that matter, negative) effect, although that may be the result of lack of adequate sector specific and time varying measures of regulation. Entry does not seem to be a key channel through which changes in regulation affect the demand for labour and capital, although there is clear evidence that entry responds strongly to the regulatory climate. The effect of entry on the reallocation of factors of production requires additional investigation.

The cross country studies are not supportive, at this stage, of a strong positive effect of less stringent regulation on direct input measures of firms' innovative activities. Actually, the studies that use the mark-up as the transmission mechanism find that lower mark-ups discourage innovation. However, this result is sensitive to the choice of the sample of countries used in estimation. There is, instead, some evidence that non-tariff barriers have a negative effect on R&D. The results based on the mark-up are at odds with some recent micro evidence for individual countries on the existence of an inverted U shaped relationship between the mark-up and firms' innovative activities. Clearly, more work is needed to resolve the theoretical ambiguities concerning the effect of product market regulation on firms' innovative activity and to come to more definitive

conclusions on this issue. Progress in this area depends upon the availability of cross

country data on firm's innovative activities that go beyond R&D spending, such as patent

counts, measures of firm's innovative investment, survey measures on the introduction of

innovations, etc. It also requires a deeper understanding of how the nature of a country's

industrial structure, the distance of a country from the technological frontier, the

availability of human capital, and other initial conditions may lead to different results.

Finally, most of the studies that include measures of regulation directly in the

regression (alone or interacted) tend to find a negative effect of tighter regulation on total

factor productivity or per capita output growth. The results for TFP growth are

particularly strong for the service sector. This cross country evidence is consistent with

the micro-econometric evidence that finds a positive and significant association between

competition and productivity growth. These results are not confirmed by studies that use

the mark-up as the channel of transmission, since in that case a decreases in the mark-up

following deregulation is associated with lower productivity growth (or level). Relying

on entry or turnover as the variable through which the effect of deregulation is

transmitted suggests a positive effect of lowering regulatory burdens on overall

productivity growth, but more work is needed in order to understand exactly how that is

distributed between the within, between and entry/exit components. The general

conclusion that can be drawn at this point is that most, but not all, the evidence points

towards a positive effect of less stringent regulation on productivity growth.

This result is very important on its own, but also has an interesting consequence

on a macro variable that has not been the focus of our survey, namely inflation. The faster

rate of productivity growth associated with less stringent product market regulation

reduces, *ceteris paribus*, inflationary pressure. In addition, if we consider the evidence that lower regulatory barriers lead to a smaller mark-up, it follows that regulatory reform may have favourable effects on inflation at short as well as longer horizons. Further systematic evidence on this issue would be very useful.

There is another important topic for future research. As we have mentioned in the introduction, many countries have introduced reforms that affect not only the output market, but also the labour market and the financial sector. It is important to investigate how the effect of product market reform depends upon the rules and regulations in the labour market, upon the regulatory structure and level of development of the financial sector, and upon other institutional features of a country. Progress in this area will sharpen our understanding of the macroeconomic effects of product market and other reforms.

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