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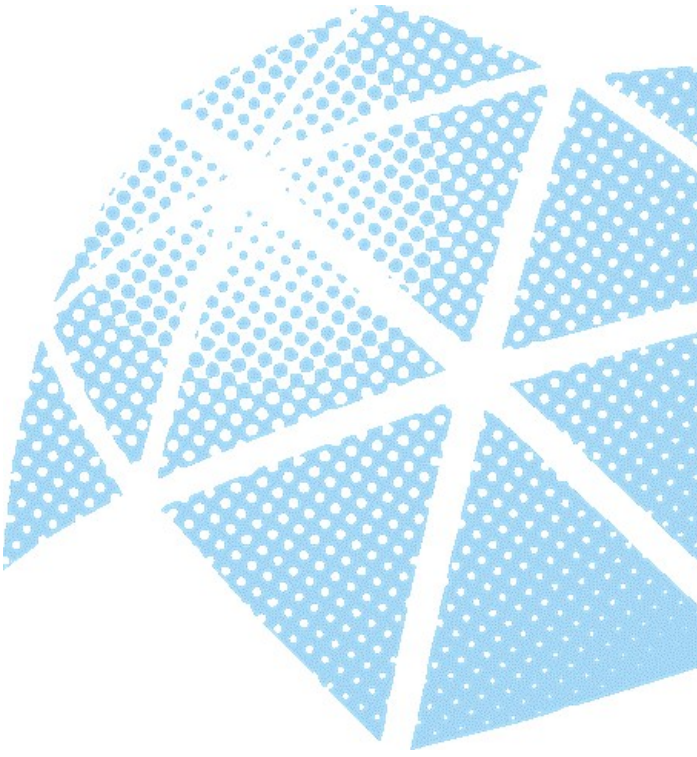
ESSAYS ON FIRM DYNAMICS AND PRODUCTIVE STRUCTURES

Alan Bueno
Production Engineering



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ESSAYS ON FIRM DYNAMICS AND PRODUCTIVE STRUCTURES

Alan Bueno
Advisor: Prof. Diogo Ferraz, Ph.D.

Thesis presented to the School of Engineering – UNESP, Bauru, as part of the requirements for obtaining the degree of Ph.D. in Production Engineering

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ATA DA DEFESA PÚBLICA DA TESE DE DOUTORADO DE ALAN BUENO, DISCENTE DO PROGRAMA DE PÓS-GRADUAÇÃO EM ENGENHARIA DE PRODUÇÃO, DA FACULDADE DE ENGENHARIA - CÂMPUS DE BAURU.

Aos 08 de abril de 2026, às 9h, por meio de Videoconferência, realizou-se a defesa de TESE DE DOUTORADO de ALAN BUENO, intitulada "ESSAYS ON FIRM DYNAMICS AND PRODUCTIVE STRUCTURES ". A Comissão Examinadora foi constituída pelos seguintes membros: Prof. Dr. DIOGO FERRAZ (Orientador(a) - Participação Virtual) do(a) Departamento de Engenharia Química e Produção / Universidade de São Paulo - USP, Prof. Dr. ENZO BARBERIO MARIANO (Participação Virtual) do(a) Departamento de Engenharia de Produção / UNESP / Câmpus de Bauru - FEB, Professor Adjunto DOMINIK HARTMANN (Participação Virtual) do(a) Departamento de Economia e Relações Internacionais / Universidade Federal de Santa Catarina - UFSC, Prof. Dr. HERICK FERNANDO MORALLES (Participação Virtual) do(a) Departamento Business / Universitat de Barcelona, Prof. Dr. EDUARDO POLLONI SILVA (Participação Virtual) do(a) Engenharia de Produção / Universidade Federal de Mato Grosso do Sul - UFMS, Após a exposição pelo doutorando e arguição pelos membros da Comissão Examinadora que participaram do ato, de forma presencial e/ou virtual, o discente recebeu o conceito final:_APROVADO_ _ _ _ _ _ _ _ _ _ _ _ _ _ . Nada mais havendo, foi lavrada a presente ata, que após lida e aprovada, foi assinada pelo(a) Presidente(a) da Comissão Examinadora.

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ESSAYS ON FIRM DYNAMICS AND PRODUCTIVE STRUCTURES

RESUMO – Esta tese investiga como as estruturas produtivas moldam a dinâmica das firmas. Partindo da ideia de que processos de entrada, sobrevivência, crescimento, saída e realocação não dependem apenas de características internas das empresas, o trabalho argumenta que esses resultados também refletem o ambiente estrutural em que as firmas operam, incluindo a complexidade produtiva, a intensidade tecnológica e a distribuição de capacidades econômicas. A tese é composta por três ensaios complementares. O primeiro realiza uma revisão sistemática da literatura sobre dinâmica das firmas e mostra que o campo permanece fragmentado, com forte concentração em economias desenvolvidas, foco excessivo em margens isoladas do ciclo de vida das firmas e pouca integração entre estrutura produtiva e resultados empresariais. Esses achados servem de base para os ensaios seguintes. O segundo ensaio analisa como a complexidade econômica afeta a entrada, a saída e a sobrevivência de firmas na Europa. Utilizando dados em nível país-setor e uma estratégia de variáveis instrumentais, os resultados indicam que estruturas produtivas mais complexas estão associadas a menor entrada de firmas, menor churn e menor sobrevivência de médio e longo prazo, com efeitos heterogêneos por porte. O terceiro ensaio examina como ambientes estruturalmente mais sofisticados e intensivos em tecnologia se relacionam com criação de empregos, destruição de empregos e realocação nos Estados Unidos. Os resultados mostram que a sofisticação produtiva afeta essas margens de forma heterogênea entre setores, medidas de exposição tecnológica e portes de firma. A Europa e os Estados Unidos oferecem contextos especialmente informativos, pois combinam altos níveis de sofisticação produtiva com configurações institucionais distintas e padrões contrastantes de dinamismo. Em conjunto, os ensaios mostram que estruturas produtivas mais sofisticadas podem tanto ampliar oportunidades quanto elevar barreiras de participação e sobrevivência, moldando de forma decisiva a dinâmica das firmas.

Palavras-chave: complexidade econômica, dinâmica das firmas, estruturas produtivas, economia aplicada

ESSAYS ON FIRM DYNAMICS AND PRODUCTIVE STRUCTURES

ABSTRACT – This thesis investigates how productive structures shape firm dynamics. Starting from the premise that firm entry, survival, growth, exit, and reallocation depend not only on firms' internal characteristics, the thesis argues that these outcomes also reflect the structural environments in which firms operate, including productive complexity, technological intensity, and the distribution of economic capabilities. The thesis is organized into three complementary essays. The first provides a systematic review of the firm dynamics literature and shows that the field remains fragmented, with a strong concentration on developed economies, an excessive focus on isolated margins of the firm life cycle, and limited integration between productive structure and firm outcomes. These findings motivate the empirical analyses developed in the following essays. The second essay examines how economic complexity affects firm entry, exit, and survival in Europe. Using country-sector data and an instrumental variables strategy, the results show that more complex productive structures are associated with lower firm entry, lower churn, and lower medium- and long-term survival, with heterogeneous effects across firm sizes. The third essay analyzes how structurally advanced and technology-intensive environments are related to job creation, job destruction, and reallocation in the United States. The findings show that productive sophistication affects these margins heterogeneously across sectors, measures of high-tech exposure, and firm sizes. Europe and the United States provide especially informative settings because they combine high levels of productive sophistication with distinct institutional configurations and contrasting patterns of business dynamism. Taken together, the essays show that more sophisticated productive structures may both expand opportunities and raise capability thresholds for market entry, participation, and survival, thereby shaping firm dynamics in fundamental ways.

Keywords: economic complexity, firm dynamics, productive structures, applied economics

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INTRODUCTION

Firm dynamics, understood as the processes of firm entry, growth, decline, and exit, constitute a fundamental component of the functioning of market economies (HALVARSSON, 2013; HALTIWANGER, 2015; AGHION; AKCIGIT; HOWITT, 2015). They shape how resources are reallocated across firms and sectors, how innovation diffuses, and how aggregate productivity evolves over time. The continuous turnover of firms is more than a demographic process: it is a mechanism through which competition operates, inefficient producers are displaced, and new organizational and technological combinations emerge (BARTELSMAN; HALTIWANGER; SCARPETTA, 2013; RESTUCCIA; ROGERSON, 2017; GIL, 2010). In this sense, firm dynamics provide the microeconomic foundation of Schumpeterian creative destruction and are therefore important to understanding structural transformation, productivity differences across countries, and the broader effectiveness of industrial and development policy (AGHION; AKCIGIT; HOWITT, 2015; AGHION; AKCIGIT; HOWITT, 2014).

Yet, despite their importance, firm dynamics remain difficult to interpret in a unified way. At the micro level, firm behavior is heterogeneous and path-dependent. Firms differ in age, size, productivity, organizational capabilities, and innovation capacity, while also operating under distinct market, institutional, and regional conditions. At the macro level, this heterogeneity translates into aggregate patterns that are often difficult to reconcile across countries and periods. In particular, the recent literature has drawn attention to a striking contrast: the sustained decline in business dynamism in the United States (reflected in lower startup rates, reduced labor market fluidity, and weaker reallocation) has raised concerns about slowing creative destruction, while the European experience appears more uneven, shaped by substantial cross-country differences in productive structure, market institutions, and firm-size composition. This contrast suggests that firm dynamics cannot be understood through a single universal mechanism. Instead, they are embedded in broader productive and institutional environments that shape both entrepreneurial opportunities and selection pressures.

This observation motivates the premise of this thesis: firm dynamics should be analyzed not only as demographic outcomes, but also as processes conditioned by productive structure, capability requirements, and the way these processes are measured. In other words, why firms enter, survive, grow, or exit depends not only on firm-specific characteristics, but also on the surrounding structure of production and on the indicators used to capture market renewal and reallocation (HAUSMANN; HIDALGO, 2011; SAVIOTTI; PYKA; JUN, 2020; BARTELSMAN; HALTIWANGER; SCARPETTA, 2013; RESTUCCIA; ROGERSON, 2017). This perspective is particularly relevant in economies characterized by increasing technological complexity, stronger

intersectoral interdependence, and persistent differences in the capabilities required to participate in modern production systems.

The general objective of this thesis is to analyze how productive structures shape firm dynamics, with particular attention to how economic complexity, technological intensity, and capability requirements influence firm entry, survival, exit, growth, job creation, job destruction, and reallocation.

This thesis is also connected to the field of Production Engineering because it examines how productive systems are organized, transformed, and constrained by structural capabilities. Production Engineering is concerned not only with efficiency within firms, but also with the broader organization of production, technological change, productivity, innovation, and the allocation of resources across productive activities. By analyzing how productive complexity and technological intensity shape firm entry, survival, job flows, and reallocation, the thesis contributes to a better understanding of the structural conditions under which productive systems evolve.

A challenge in this research area is the pronounced fragmentation of the existing literature. Prior studies typically examine specific dimensions of firm dynamics, such as entry (VIVARELLI, 2013; GEROSKI, 1995) , exit (CEFIS et al., 2022) , survival (CABRAL, 2007; GIL, 2010; SANTARELLI; VIVARELLI, 2007) , or growth (COAD; HöLZL, 2012; COAD, 2009) , separately rather than treating them as interconnected stages within an integrated firm life-cycle framework. The literature is geographically uneven, with strong concentration in advanced economies and limited cross-country evidence that jointly accounts for structural heterogeneity, productive sophistication, and comparable firm-dynamics measures. In addition, different theoretical traditions emphasize different mechanisms, including passive learning, market selection, institutional frictions, or technological change, without always offering an integrated empirical perspective. Finally, measurement remains a persistent challenge: standard indicators such as birth and death rates capture only partial dimensions of business dynamism, while more sophisticated measures of job flows and reallocation still leave open the question of how to summarize the broader quality and intensity of market renewal.

This thesis addresses these issues through three complementary essays. Together, they investigate the literature, determinants, and measurement of firm dynamics from a unified perspective centered on structural conditions and heterogeneous firm responses.

The first essay, *The Evolution of Firm Dynamics: A Systematic Review and Research Agenda for Management and Economic Policy*, provides a systematic review of the firm dynamics literature. Its main contribution is to transform a fragmented literature into an empirically actionable research agenda, organized around ten recurring gaps and their implications for theory, data, and measurement. The review identifies ten important

gaps, including the limited attention given to developing countries, the insufficient treatment of social and institutional dimensions, the lack of cross-country comparable databases, and the relatively weak integration across different stages of the firm life cycle. By mapping these limitations, the first essay establishes the need for a more integrated research agenda and provides the conceptual foundation for the empirical analyses that follow.

Building on this diagnosis, the second essay, *Economic Complexity and Firm Dynamics: Evidence from European Industries*, examines how economic complexity affects firm dynamics in Europe. Its main contribution is to show, with country-sector instrumental variables (IV) evidence, that economic complexity in Europe operates less as a uniformly entrepreneurial environment and more as a selective filter shaping entry, churn, and survival. Europe offers a particularly useful setting because it combines advanced productive structures with strong cross-country institutional heterogeneity under relatively harmonized statistical frameworks. The results also indicate that complexity is associated with lower medium- and long-term survival, especially for larger firms, while the negative relationship between complexity and longer-horizon survival is weaker for microenterprises, despite a more restrictive entry margin. Taken together, the evidence suggests that, in the European context, economic complexity operates less as a uniformly enabling entrepreneurial environment and more as a selective filter: it raises participation thresholds, reduces broad-based market turnover, and generates heterogeneous survival outcomes across firm sizes.

The third essay, *Economic Complexity and the Decline of Business Dynamism: Revisiting Creative Destruction*, extends the analysis to the United States by examining how structurally advanced and technology-intensive environments are related to job creation, job destruction, and reallocation dynamics. Its main contribution is to reconnect economic complexity to the debate on declining U.S. business dynamism by showing that structurally advanced environments affect job creation, destruction, and reallocation in heterogeneous ways across sectors and firm sizes. The United States is a natural setting for this analysis because the debate on declining business dynamism, labor-market fluidity, and weakening reallocation is especially developed in the U.S. literature. Using state-industry data and measures of high-tech exposure, the chapter investigates how the composition of productive activity affects creative destruction margins. The results indicate that technology-intensive environments are associated with distinct patterns of job flows and reallocation, with important heterogeneity depending on the type of high-tech exposure considered and on firm size. This chapter therefore complements the European evidence by showing that advanced productive structures can simultaneously sustain some forms of adjustment while dampening others, helping

explain why highly developed economies may display both technological sophistication and weaker aggregate dynamism.

Taken together, the three essays offer a broader interpretation of firm dynamics in contemporary economies. The first essay shows that the field lacks integration and still faces major conceptual and empirical blind spots. The second essay demonstrates that productive complexity in Europe tends to strengthen selection pressures rather than broadly stimulate entrepreneurship. The third essay shows that, in the United States, the relationship between structural sophistication and dynamism is also deeply heterogeneous, helping to reconcile the coexistence of technological advancement with concerns about declining creative destruction. In this sense, the thesis contributes to the literature by showing that firm dynamics are not simply a reflection of entrepreneurial vitality, but also of the capability thresholds, structural constraints, and measurement choices that shape who enters, who survives, and how reallocation unfolds.

The thesis therefore makes three specific contributions. First, it advances the firm dynamics literature by moving beyond single-margin approaches and showing that entry, survival, churn, and reallocation should be interpreted as interdependent outcomes shaped by the structural characteristics of the productive environment rather than as isolated demographic events. Second, it contributes to the literature on economic complexity and productive structure by demonstrating that sophisticated environments do not uniformly stimulate entrepreneurial renewal: in Europe, higher complexity is associated with lower entry, lower churn, and lower medium- and long-term survival, indicating that productive sophistication often operates as a selective filter that raises capability thresholds for participation and persistence. Third, it contributes to the measurement and interpretation of business dynamism by showing that the meaning of dynamism depends on which margin is observed, at what level of aggregation, and in which technological setting: evidence from the United States indicates that structurally advanced environments can intensify reallocation and adaptation in some frontier-oriented sectors while reducing mobility and reinforcing incumbent advantages in others. Taken together, these findings provide a more conditional and structurally grounded interpretation of business dynamism and its relationship with structural transformation.

More broadly, the findings carry important policy implications. Policies aimed at stimulating entrepreneurship, competition, and productivity growth cannot rely solely on increasing the number of entrants or reducing generic regulatory frictions. In both Europe and the United States, structurally advanced environments do not simply create more opportunities; they also raise the capability thresholds required for firms to enter, survive, scale, and diversify. Effective policy should therefore focus on broadening

access to the complementary assets that sustain participation in complex economies, including skills, growth finance, technological infrastructure, and knowledge networks (BARTELSMAN; HALTIWANGER; SCARPETTA, 2013; BECK; DEMIRGUC-KUNT, 2006; AKCIGIT; ATES, 2023). This also implies supporting capability accumulation at the regional level through specialized training systems, supply-chain deepening, universities, research institutions, and collaborative platforms that reduce technological distance and facilitate related diversification (NEFFKE et al., 2018; BALLAND et al., 2020; AKCIGIT; ATES, 2023). Finally, the evidence suggests that the quality of reallocation matters as much as its quantity: not all turnover is equally productivity-enhancing, and policy should aim to build a fairer and more dynamic selection environment in which market renewal is driven by efficiency, innovation, and feasible capability upgrading rather than by structural bottlenecks or size-related disadvantages (FOSTER; HALTIWANGER; KRIZAN, 2001; HSIEH; KLENOW, 2014; RESTUCCIA; ROGERSON, 2017).

Although the empirical chapters focus on Europe and the United States, their implications are also relevant for Brazil. These cases are not treated as institutional models to be replicated, but as analytically useful settings in which harmonized data and consolidated debates allow the relationship between productive structure and firm dynamics to be examined more clearly. Brazil remains an important case for this agenda because productive capabilities are unevenly distributed across regions and sectors, and because informality, regional heterogeneity, and unequal access to capabilities make firm entry, survival, scaling, and reallocation especially relevant for future research and policy discussions. Some recent advances in the literature on Brazil and productive structures and firm dynamics can be found in Bueno et al. (2025).

The remainder of this thesis is organized as follows. Chapter 1 presents the systematic review of the firm dynamics literature. Chapter 2 analyzes the relationship between economic complexity and firm entry, exit, and survival in Europe. Chapter 3 examines how structurally advanced and technology-intensive environments shape job flows and reallocation in the United States. The final chapter concludes by summarizing the main findings and discussing their implications for research and policy.

CONCLUSION

This thesis set out to investigate how productive structures shape firm dynamics. Across three complementary essays, it advances one central claim: productive sophistication does not translate mechanically into more entrepreneurial, more open, or more fluid market dynamics. Instead, the effects of productive structure on firm dynamics are dual and regime dependent. In some contexts, dense capability environments expand feasible combinations, facilitate adjustment, and sustain recombination close to the technological frontier. In others, the same environments raise capability thresholds, intensify selection, reduce broad-based turnover, and stabilize incumbent positions. The main lesson of the thesis is therefore that business dynamism cannot be interpreted apart from the structural conditions in which it unfolds.

The first essay established the conceptual foundation for this argument by showing that the firm dynamics literature remains fragmented across theoretical traditions, empirical strategies, geographic coverage, and margins of analysis. Most importantly, the review identified ten recurring gaps and translated them into an empirically actionable research agenda. The two quantitative essays respond directly to several of these gaps, especially G3, G6, G7, and G10. They address the scarcity of size- and sector-sensitive evidence, the lack of harmonized comparative designs, the insufficient integration between firm dynamics and productive structures, and the predominance of single-margin interpretations of market renewal. In this sense, the thesis does not merely add two empirical applications to an existing literature; it operationalizes a research agenda derived from a systematic diagnosis of the field itself.

The second essay showed that, in Europe, higher economic complexity is associated with lower firm entry, lower churn, and lower medium- and long-term survival, with heterogeneous effects across firm sizes. Once endogeneity is addressed, these effects become stronger rather than weaker, reinforcing the interpretation that complexity operates less as a broadly enabling entrepreneurial environment than as a selective filter. The third essay extended this logic to the United States and demonstrated that the relationship between complexity and business dynamism is not monotonic. In frontier-oriented sectors, complexity can sustain job creation, destruction, and reallocation by lowering technological distance and enabling recombinant adjustment. In more cumulative and incumbent-dominated settings, however, the same capability density may reduce reallocation and reinforce creative accumulation rather than broad-based renewal.

Taken together, these results generate three main advances. First, the thesis contributes theoretically by showing that firm dynamics should be interpreted as a structurally embedded process rather than as a set of isolated demographic outcomes.

Entry, survival, churn, job creation, and reallocation are not interchangeable signals of market vitality; they are distinct margins whose meaning depends on productive structure, technological regime, and capability thresholds. Second, the thesis contributes to the economic complexity literature by moving beyond aggregate growth and diversification outcomes and showing that complexity also shapes who can enter, survive, experiment, and adjust. Third, it contributes methodologically by demonstrating that the interpretation of business dynamism changes substantially depending on the margin observed, the level of aggregation, and the structural environment under consideration.

Business dynamism should no longer be treated as a uniform or self-explanatory indicator of economic health. The same observed decline in turnover or reallocation may reflect very different structural realities depending on whether firms operate in capability-dense frontier sectors, mature cumulative industries, or lagging regional systems. Future research should therefore pay closer attention to productive structure, technological regimes, and multidimensional measurement strategies when interpreting market renewal, creative destruction, and productivity dynamics.

The policy implications of this thesis suggest that restoring dynamism cannot rely exclusively on generic pro-entry, pro-competition, or horizontal entrepreneurship policies. If capability density, technological distance, and knowledge connectivity shape who can participate in market renewal, then policy must also act on the regional and sectoral distribution of capabilities. This implies a capability-based policy mix: place-based investments in specialized training systems, applied technical institutions, and supply-chain deepening; support for related diversification into technologically adjacent activities; and stronger bridging institutions linking entrants, incumbents, universities, and knowledge networks. The contribution of this thesis is to show that such policies are not only relevant for long-run development and regional upgrading, but also for understanding why some advanced economies remain innovative yet weakly dynamic, while others sustain more intense renewal and reallocation.

The evidence from Europe and the United States also offers lessons for Brazil. The main implication is not that Brazil should reproduce the institutional trajectories of advanced economies, but that productive sophistication can simultaneously create opportunities and raise capability thresholds for market entry, participation, and survival. In a country marked by regional heterogeneity, informality, and uneven access to capabilities, policies aimed at entrepreneurship and productivity should therefore consider not only firm creation, but also the conditions that allow firms to survive, scale, innovate, and participate in more complex productive systems.

In conclusion, the thesis advances a more conditional and structurally grounded interpretation of firm dynamics. Productive structures are not merely the backdrop

against which firms compete. They shape the thresholds of entry, the conditions of survival, the scope for recombination, and the quality of reallocation. By showing that productive sophistication may simultaneously generate opportunity and exclusion, adaptation and entrenchment, the thesis offers a more precise account of how creative destruction operates in advanced economies. Ultimately, the challenge for both research and policy is not only to ask whether economies are dynamic, but also to ask for whom, through which margins, under what structural conditions, and with what consequences for long-run development.

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